



# Salamanders!

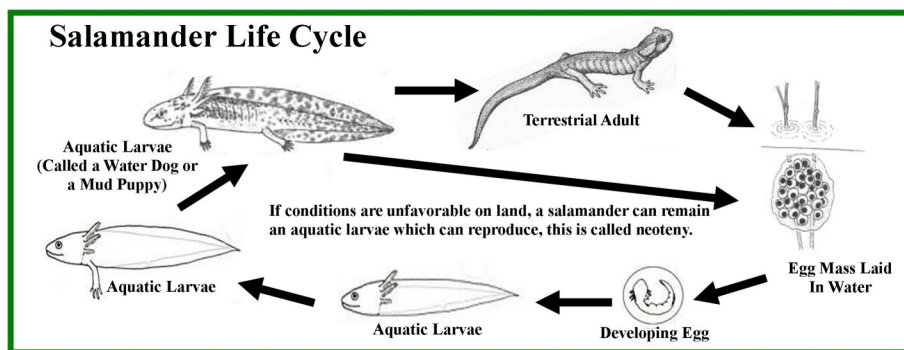


**Salamanders are amphibians.** *Amphibian* means “double-life”, referring to a two-stage life-cycle (larval to adult transformation). The notable exception here is the Eastern Newt, which shows us four stages in its life cycle.

Amphibians are NOT reptiles. Amphibians lack claws on their feet, lack scales, have moist skin, lay unshelled eggs (lack the calcareous shell found in reptile and bird eggs), and respire through the skin, gills, or lungs.

Salamanders are also called “*Ghostphibians*”, as they are secretive and nocturnal. Salamanders or “Sallies” live most of their life in the ground. They only come out of water to migrate to a *congress* or mating site and lay/fertilize eggs. Those that live in the water for the majority of their life (such as the mudpuppy or hellbender), spend most of that time hiding on the bottom underneath wet-land debris.

There are nearly 400 species of salamanders worldwide. 70 species live in Central and North America.



## Indiana: 22 species and two hybrid unisexual complex species.

Family	Species	
<u>1. Sirenidae</u>	Western Lesser Siren	
<u>2. Cryptobranchidae</u>	Eastern Hellbender	
<u>3. Proteidae</u>	Common Mudpuppy	
<u>4. Plethodontidae</u> (lungless salamanders)	Northern Dusky Salamander Four-Toed Salamander Long-tailed Salamander Southern Two-lined Salamander Cave Salamander	Green Salamander Northern Slimy Salamander Northern Zigzag Salamander Eastern Red-backed Salamander Northern Ravine Salamander
<u>5. Salamandridae</u>	Eastern Newt	
<u>6. Ambystomatidae</u>	Jefferson Salamander Blue-spotted Salamander Marbled Salamander Mole Salamander Spotted Salamander	Eastern Tiger Salamander Small-mouthed Salamander Streamside Salamander  <i>and Unisexual Ambystoma</i>

## 1. Sirenidae– Western Lesser Siren:



**Description:** Western Lesser Sirens are a long, eel-like salamander with bushy **external gills**, a flattened tail, and tiny front legs (*and no hind legs*). Color is gray, brown, or olive. Adults are 7 to 19.7 inches (118 to 50 cm) long.

**Habitat/Habits:** In Indiana, this siren is known to be found only in the shallow lake edges of western Indiana. Calm muddy waters, with abundant plant growth, are preferred habitats. Sirens can move overland in damp weather to colonize new habitats. They eat small invertebrate animals, including insects, crayfish, and snails.

**Breeding:** Siren mating habits are poorly known. Two hundred or more eggs are laid by the female, in shallow bottom depressions. The larvae mature in about 2 to 3 years.

**Conservation:** Sirens are secretive and easily overlooked. Their primary range extends from northern Indiana to the U.S. Gulf coast and Florida. Report any Indiana sightings of this species to the IDNR Wildlife Division.

## 2. Cryptobranchidae– Eastern Hellbender:



**Description:** The Eastern Hellbender is a large (13-24 inches), wrinkly skinned, completely *aquatic* salamander. The Hellbender body is flattened dorso-ventrally, with fleshy folds of skin on the sides. The main color is usually brown, but sometimes green, red, or yellow. Its eyes are small. Hellbenders do have gill slits present, but no external gills in adults.

**Habitat:** Hellbenders live in medium to large, rocky streams that are not excessively silty and have an abundance of crayfish (a major food item). Individuals spend most of their time under very large rocks.

**Life history:** Breeding occurs in September. Males guide females into nests they have excavated under rocks or logs. Several females may lay eggs in a single male's nest, where they are externally fertilized. Hatching occurs two months later. Aquatic gilled larvae go through a partial metamorphosis 1.5-2 years later, losing their gills. Sexual maturity is reached at 5-8 years, and longevity is suspected to be 25-60 years.

**Conservation:** Threats to Hellbenders include pollution and degradation of stream habitat, removal of rocks, stream channelization and damming, and intentional killing and collection. The greatest threat is excessive siltation, resulting from the conversion of forests to agriculture and human development.

### 3. Proteidae– Common Mudpuppy



**Description:** One of only two permanently aquatic salamanders in Indiana, and the only salamander to retain external gills throughout its life. Most adults reach about 13" in length and have a brown to gray ground color. Darker spots or blotches along the body are common. Bushy red gills on either side of the head are the most prominent identifying feature of the Mudpuppy.

**Habitat:** Extremely variable, being found in small streams, larger rivers, oxbows, reservoirs and lakes.

**Life history:** Breeding occurs in autumn, but eggs are not laid until the following spring or early summer. Nests are excavated under large logs or rocks, where the females attach 50-100 eggs to the roof of the cavity. The eggs hatch one to two months later, and the young never completely metamorphose. Instead, these "Peter Pan's" of the salamander world live their entire 2+-year life underwater.

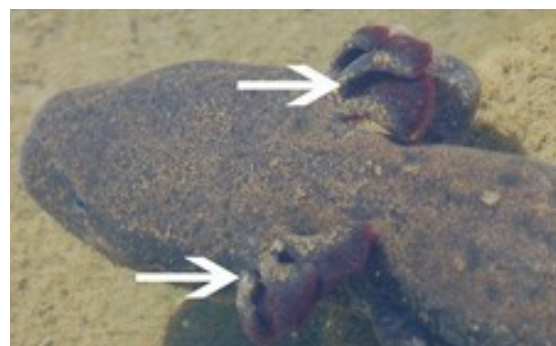
**Conservation:** Recent records for the Mudpuppy are scarce, although in some places they may be relatively common. Although more tolerant of siltation than the other aquatic salamander (the Hellbender), excessive siltation can be detrimental to the Mudpuppy. The species is intolerant of lampricides, and hundreds of dead Mudpuppies are found following lampricide applications in northeast rivers. Channelization has made many habitats unsuitable for Mudpuppies. Logging and agriculture along waterways increase siltation and runoff. The Mudpuppy is often killed when captured by fisherman, as many erroneously believe they are harmful.

#### Differences between Mudpuppies and Hellbenders:

**Does it have external gills?** Adult Hellbenders do not have external gills, just gill slits. The external gills of Mudpuppies appear as bushy, red-colored appendages on either side of the head. Note that the gills may be very small in well-oxygenated habitats and can be difficult to see when the animal is removed from the water. If external gills are present, then it is a Mudpuppy.



**Hellbender = gill slits**



**Mudpuppy = external gills always**



*Differences between Mudpuppies and Hellbenders continued:*

**Is the skin smooth and tight or loose and wrinkly?** Hellbenders breathe through their skin, so they have wrinkly folds along the sides of the body to increase the surface area for gas exchange.



Mudpuppies breathe mostly through their external, so their skin is tighter against the body giving the animal a smoother appearance. If the skin is *not* noticeably wrinkly, then you probably found a Mudpuppy.

**How big is it?** The largest recorded size for a Mudpuppy captured is over 14 inches, but most do not exceed 12 inches in total length. Hellbenders, such as the one pictured here, always grow larger than Mudpuppies and may reach up to 24 inches in length.



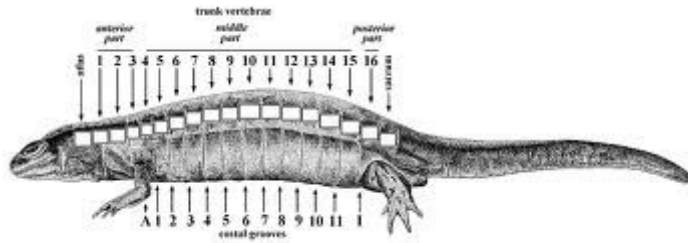
*(Note to anglers: The use of measuring tape - while typically avoided so as to not spoil your fishing stories - is a necessity in this case.)*

#### **4. Plethodontidae – “Lungless salamanders” – 10 species in Indiana. Only one is common. Eastern Red-backed Salamander (*Plethodon cinereus*):**



**Description:** The Eastern Red-backed Salamander is a small (>5", 7-12cm) woodland salamander with short legs. The Genus *Plethodon* means “full of teeth.” The species *cinereus* is Latin for “ash-colored”. Its tail makes up less than half of the total body length. The ground color is black to dark brown. Individuals may be of two common morphs (colorations). The striped morph has a broad, straight-edged, orange-red stripe extending down the back and onto the tail. The lead-phase (unstriped morph) lacks this stripe. The underside is speckled black and white; The lead-phase also presents more black coloration than the otherwise similar Northern Ravine Salamander. The Eastern Red-backed Salamander has 18-20 *coastal* grooves. Only count the grooves found between the front and hind legs.

*Lungless salamanders continued:*



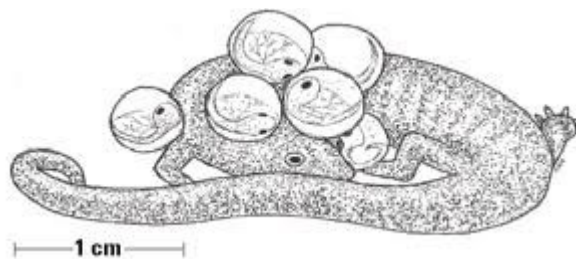
## Coastal Grooves

**Coastal grooves** are easy to spot on the spotted salamander (pictured right). They are found below its yellow spots and behind the front limbs.

In **Herpetology** (the study of amphibians and reptiles), costal grooves refer to lateral indents found along the integument (side) of salamanders. The grooves run between the front limbs to the groin. Each groove overlies the myotomal septa, which divides the myotome or muscle areas containing a single spinal nerve and each groove also marks the position of the internal rib.

**Habitat:** Moist forests, especially forested, rocky hillsides. The Eastern Red-backed Salamander is usually found under rocks, logs, fallen bark, or leaf litter. Much of its life is spent underground. Most abundant in woods in May.

**Life history:** Eggs are laid in June, suspended like a bunch of grapes within a rotting log or under a rock. There are usually 3-14 eggs in a clutch, and the female attends to these until hatching in August. The larval stage takes place within the egg so the hatchlings look like miniature adults. The young become sexually mature 2 years.



Larval stage hatchlings look like miniature adults in the egg.

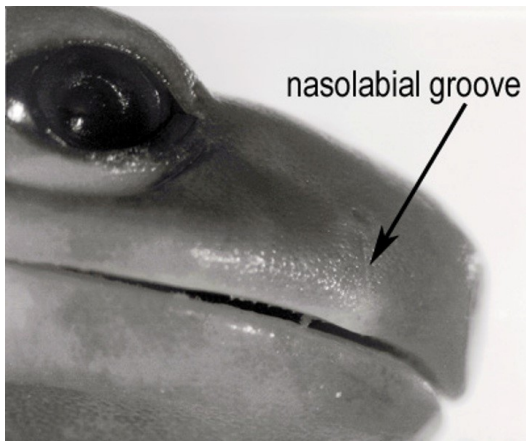
**Conservation:** Red-backed Salamanders are tied to moist forest habitats. Destruction of these habitats is the greatest threat to populations. Logging of forests causes an increase in temperature and the rate of evaporation and also reduces the leaf litter so important for this species and its prey. Like all lungless salamanders, pollutants, including herbicides and pesticides, are easily absorbed and toxic to the Red-backed Salamander.

Salamanders exchange gasses across their skin. The skin is thin and permeable and kept moist for proper gas exchange. **Keep hands moist and no soap/lotion/sanitizer residue when handling salamanders or any amphibian.** Rinse your hands well with water before handling amphibians and then wash your hands once you have completed your field studies or at least before eating.



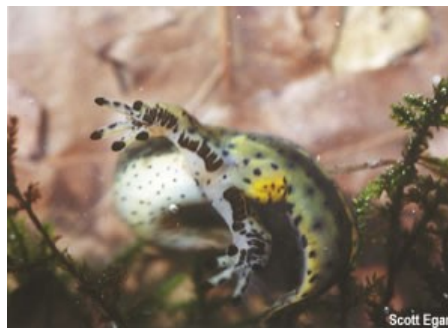
*Lungless salamanders continued:*

**Nasolabial grooves:** indentation between the nair or external opening of nostril and the upper lip (shown in this picture below). Mole Abystomatids (such as our tiger and Jefferson hybrid complex salamanders found most commonly at Fox Island County Park) don't have this. Metea County Park does have Red-backed salamanders.



The nasolabial groove is lined with glands, and enhances the salamander's chemoreception.

## 5. Salamandridae-Eastern Newt:



**Description:** The Eastern Newt lack *costal grooves*, *nasolabial grooves*, and produce highly toxic secretions. Most sport bright coloration to serve as a warning to predators. The toxin contains tetrodotoxin which is thought to be one of the most lethal toxins known. The red eft immature stage is the period of highest toxicity. Possess lungs instead of gills. Some adults may rarely retain remnants of gills. Adults are green to brown and have a series of red spots along the back and tail. The underside is usually yellow to orange and speckled with black dots. A dark stripe passes through each eye. Adults average 10cm in length. Male Eastern Newts develop breeding knobs on their inner thighs during the breeding season. The red eft is the terrestrial stage of the Eastern Newt. They are typically red to brown with rough dry skin that has bright red spots along the length of their back and tail. Eft stages average 3-5cm in length. After spending 2-7 years as a terrestrial eft, red efts will migrate back to their natal pools and undergo a second metamorphosis into adults.

*Eastern Newt continued:*

**Habitat:** Found just North of Allen County. Terrestrial wetlands surrounded by woods. Terrestrial during juvenile stage, all aquatic during adult stage. The Eastern Newt is the sole representative of this family in Indiana. Two subspecies occur in Indiana – the Central Newt and the Red-spotted Newt. They are similar except for the red spots on the back and tail of the Central Newt are not completely encircled with black; and the red spots may be lacking altogether - especially in the adult aquatic form. They breed in stream or lake environments and have internal fertilization.

**Life History:** The red-spotted newt has one of the most complicated life histories of any pond-breeding amphibian because it has four, not three, life stages (egg, aquatic larva, terrestrial eft, and aquatic adult). Newts eggs are laid singly (attached to aquatic vegetation) in the spring. In 30 days, the aquatic larvae will hatch. Larvae will grow and develop for 2-3 months. In the fall, some larvae undergo metamorphosis and transform into a juvenile terrestrial form referred to as an 'eft'. The terrestrial eft stage lasts for 2-7 years, then newts undergo a second metamorphosis -from eft to adult- before returning to ponds to breed. Life history strategies of this species are highly variable. In some areas, the eft stage is reproductively active, while in other areas the eft stage is absent and neotenic newts never leave breeding ponds. In some instances where a local pond dries up, adult Newts leave the water and aestivate on land. Individuals may become darker and their skin will roughen. These adults will resemble the red eft stage, but will be noticeably larger in size.

**Conservation:** In Indiana, the Eastern Newt may be found throughout the state and is considered common. The Central Newt occurs in the western half of the state, while the Eastern Newt is in the eastern portion. Much of Indiana consists of an inter-grade zone with many populations exhibiting characteristics of both species.

## 6. Ambystomatidae – “Mole Salamanders” – 8 species in Indiana. Most common in NE are the Tiger Salamanders, Spotted Salamanders, and a unisexual hybrid (referred to here as the Jefferson complex):

**Description:** Medium to large in size, with robust limbs and prominent coastal grooves (12-14). Tiger salamanders are 33-35cm long. Spotted salamanders are 15-25cm. Jefferson salamanders are 10-21cm. Blue-spotted Salamanders are 7-14cm long. Transformed adults of all species have well-developed lungs. This family includes 30 species. *Ambystoma* is the only recognized genus within the family Ambystomatidae. This is an ancient genus, dating back 30 million years. Some adults will live over 20 years. Most Ambystomatid salamanders secrete a milky white toxin from the dorsal portion of the tail if disturbed. These secretions serve as a predator deterrent and are not fatal to humans. They may cause eye irritation.



*Mole Salamanders continued:*



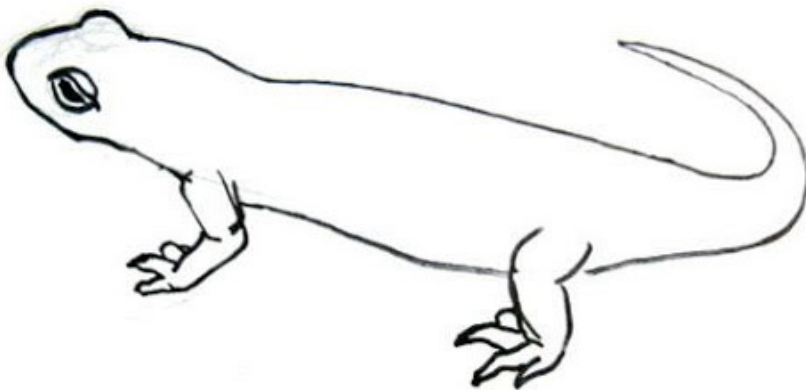
**Habitat:** They spend most of their life on land underground – hence the name “mole” salamanders. They will also stay in the burrows of other creatures, except when breeding. Indiana is home to 8 species of *Ambystoma*; no other state is home to more of this kind of species.

**Life History:** They are typically spring breeders, although breeding may occur from November to May (depending on latitude). Migrations to breeding sites occur at night during rainy weather, and breeding is usually confined to one to three brief bouts during, or immediately following, fall or spring rains. Breeding locations are variable among different species. All species in this family have an aquatic stage, in mainly fishless bodies of water. Nearly all lay eggs on submergent vegetation within the wetlands. The number of eggs produced can range from 150-7,000 eggs per female per season. Females will lay eggs singly, in loose clusters, or in large masses. The length of egg development depends on environmental conditions. The range is 19-50 days after fertilization. The newly hatched larvae are voracious predators and feed on a wide variety of aquatic organisms. The larval stage may last 2.5-5 months and is HIGHLY dependent on food abundance, density, water temperature, and seasonal time of pond drying.

**Conservation:** These fishless bodies of water are critical to the survival of embryos and larvae. Freezing, predatory insects, fungal infections, cannibalism in the case of food shortages, and pond drying are prominent factors in juvenile mortality rates. Data is lacking for several species, but adult survival is thought to be high. Some live over 20 years. The greatest threats are the destruction of woodlands, the draining of ephemeral breeding ponds, and the introduction of predatory fish into formerly fishless lakes and ponds.

**A Salamander Congress:**

YouTube has some videos showcasing spotted salamanders that are worth looking at!



This little guy is sadly plain. That is because he is waiting to be colored in by you to match a salamander you have found. A quick cell phone photo will let you release your salamander now and still get your colors and markings just right. Being careful of handling (pg. 5), measure your salamander and record it. What was the area and weather like when you found your salamander? Notes like that will help you find more in the future.

